

05/03/2009

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at page 3, line 5, with the following rewritten paragraph:

In the molding step, a metal compound feed compact can be molded by mixing a metal compound, a binder, and ~~an active metal compound as a reaction agent~~ at least one compound selected from oxides of magnesium, sodium, barium and potassium; halides of calcium, magnesium, sodium, barium and potassium; and carbonates of magnesium, sodium, barium and potassium.

Please delete the paragraph beginning at page 3, line 9:

~~At least one of compound of an active metal selected from calcium, magnesium, sodium, barium and potassium is preferably used for the reaction agent.~~

Please replace the paragraph beginning at page 4, line 3, with the following rewritten paragraph:

The metal compound feed compact may contain at least one ~~of compound of a metal selected from calcium, magnesium, sodium, barium and potassium as a reaction agent. The reaction agent is preferably one selected from an oxide, halide, and carbonate of at least one of metal selected from calcium, magnesium, sodium, barium and potassium comprising at least one compound selected from oxides of magnesium, sodium, barium and potassium; halides of calcium, magnesium, sodium, barium and potassium; and carbonates of magnesium, sodium, barium and potassium.~~

Please replace the paragraph beginning at page 6, line 23, with the following rewritten paragraph:

In addition, in the aforementioned molding step for producing a niobium compound feed compact, the niobium compound feed compact can be produced by additionally mixing in a ~~reaction agent~~ an active metal oxide, halide or carbonate, as described above, compound as a reaction agent in addition to the niobium compound and binder. Although an active metal compound as the aforementioned, ~~reaction agent~~ at least one compound selected from oxides of

magnesium, sodium, barium and potassium; halides of calcium, magnesium, sodium, barium and potassium; and carbonates of magnesium, sodium, barium and potassium can also be used as a binder, it can also be used to control the morphology of deposit of the niobium powder as well as increase acid treatment efficiency. In this manner, by producing the niobium compound feed compact by mixing in an active metal compound (oxide, halide, carbonate) in addition to the niobium compound and binder, the reaction in the reducing step proceeds more uniformly and the production efficiency can be increased. Moreover, the particle size of the resulting niobium powder can also be controlled by regulating the type and mixing ratio of the aforementioned ~~reaction agent~~ active metal compound. In addition, contamination from the reaction vessel can also be effectively prevented.

Please replace the paragraph beginning at page 7, line 11, with the following rewritten paragraph:

~~A compound of at least one of metal selected from calcium, magnesium, sodium, barium and potassium is preferably used for the aforementioned reaction agent, and an oxide, halide, carbonate, hydroxide, chloride and/or fluoride of these metals is used more preferably. The reaction efficiency and uniformity of the reducing step can be further enhanced by using a compact containing this type of active metal compound as a reaction agent.~~

Please replace the paragraph beginning at page 8, line 6, with the following rewritten paragraph:

Moreover, the aforementioned niobium powder production process may additionally contain a step in which the niobium formed in the aforementioned reducing step, reducing agent, ~~reaction agent~~ active metal compound, as described, and by-products are separated by acid treatment. By providing a step in which these substances are separated by acid treatment, the reducing agent, ~~reaction agent~~ active metal compound, as described, and by-products formed after the reduction reaction can easily be separated from the objective niobium, enabling the large-volume production of high-purity niobium. In addition, in the production process according to the present invention, since a niobium compound feed compact is used in the reaction, the shape of the aforementioned compact is nearly maintained even after reduction. Consequently,

by performing acid treatment on the compact following this reduction, there is the advantage of being able to efficiently remove the reducing agent and by-products.

Please replace the paragraph beginning at page 8, line 17, with the following rewritten paragraph:

In conventional rare metal production processes, it is considered that the reason for the the greatest not to obtain a uniform powder is that no uniformity is caused by the part of raw material in the progression condition of the reduction reaction timewise and spatially since the diffusion of the reducing agent in the raw material becomes a ununiformity when the amount of reduction is increased. In contrast, in the niobium powder production process according to the present invention, since a niobium compound feed compact is produced by mixing niobium raw material, binder and/or ~~reaction-agent~~ active metal compound (oxide, halide and carbonate), and a reduction reaction is carried out by contacting this mixture with an active metal, the reduction reaction is able to proceed uniformly in terms of both time and space even if the amount of reduction increases. In addition, since the reduction reaction is allowed to proceed by placing the niobium compound feed compact in a reduction device, continuous operation and increased scale of the reduction process as well as improved efficiency of batch processing can be carried out with a simple device. Namely, although continuous operation and acceleration of the process were difficult with the conventional metallothermic reduction reaction, since the niobium compound feed compact used in the aforementioned niobium powder production process makes it possible easily achieve a continuous work flow with respect to production, heat treatment, reduction, cleaning and so forth, the process can easily be operated continuously and increased in scale. In addition, although there were many cases in which the particle size and so forth of the resulting powder was not uniform and productivity was low if the amount of raw material was increased in the processes of the conventional method, according to the aforementioned production process, increased scale and speed of the reduction process can easily be achieved while maintaining the uniformity of the particle size of the resulting powder, thereby making it possible to improve productivity.

Please replace the paragraph beginning at page 10, line 7, with the following rewritten paragraph:

In the niobium powder production process according to the present invention, niobium powder can be produced by a metallothermic reduction method that uses the aforementioned production device. In order to produce the aforementioned niobium powder, a niobium compound feed compact containing a niobium compound which is the raw material is first produced in a molding step. This compact is obtained by mixing this niobium raw material with a binder and reaction-agent at least one compound selected from oxides of magnesium, sodium, barium and potassium; halide of calcium, magnesium, sodium, barium and potassium; and carbonates of magnesium, sodium, barium and potassium, molding to a predetermined shape, and then firing at a temperature of preferably 300 to 1000°C, and more preferably 800 to 1000°C, to remove the binder. If the aforementioned firing temperature is lower than 300°C, since the binder and reaction-agent active metal compound described are unable to be adequately removed, the reaction efficiency in the following reducing step tends to decrease, and the purity of the resulting powder also tends to decrease. If the firing temperature exceeds 1000°C, sintering proceeds excessively rapidly, which tends to cause a considerable change in the niobium compound feed compacts. In addition, although dependent on the dimensions and heating temperature of the compacts, this firing step is preferably carried out for 1 to 12 hours, more preferably for 1 to 6 hours, and even more preferably for 3 to 6 hours. In addition, in the case of carrying out firing, it is preferable to carry out in air or an oxygen atmosphere.

Please replace the paragraph beginning at page 11, line 8, with the following rewritten paragraph:

Any binder can be applied without problem in the case that it can be easily removed by heat treatment regardless of the reduction reaction, examples of which that can be used include collodion and cellulose. In addition, a reaction-agent at least one compound selected from oxides of magnesium, sodium, barium and potassium; halides of calcium, magnesium, sodium, barium and potassium; and carbonates of magnesium, sodium, barium and potassium can also be used as a binder, and a compact can be formed by mixing a niobium raw material and reaction-agent active metal compound. The mixing ratio of binder in the aforementioned niobium compound

feed compact is preferably 5 to 80% by weight, more preferably 30 to 70% by weight, and even more preferably 30 to 50% by weight. If the mixing ratio of binder is less than 5% by weight or more than 80% by weight, the strength of the compact tends to decrease and it tends to be difficult to form the compact.

Please replace the paragraph beginning at page 11, line 17, with the following rewritten paragraph:

The ~~reaction-agent~~ active metal compound is added to the niobium raw material and binder as necessary to form a compact by them. The reaction efficiency in the reducing step can be enhanced and the reduction of the niobium raw material can be carried out more uniformly by dispersing the ~~reaction-agent~~ active metal compound in the compact. ~~A compound of at least one of metal selected from the group consisting of calcium, magnesium, sodium, barium and potassium is preferably used for this reaction agent, and oxides, halides, carbonates, hydroxides, chlorides and/or fluorides of these metals are used more preferably. More specifically, calcium chloride, calcium carbonate, sodium carbonate or sodium chloride and so forth can be used alone or as a mixture.~~ The mixing ratio of the aforementioned reaction agent is preferably such that cations in the ~~reaction-agent~~ active metal compound are preferably blended at 0 to 2 moles and more preferably at 0.5 to 1 mole with respect to 1 mole of niobium contained in the compact. In the case the cation in the ~~reaction-agent~~ active metal compound exceeds 2 moles with respect to 1 mole of niobium contained in the compact, the amount of acid used for acid washing tends to increase and leaching efficiency tends to decrease when separating the formed niobium by acid treatment.

Please replace the paragraph beginning at page 14, line 6, with the following rewritten paragraph:

Next, the compacts for which the reduction reaction has been completed are removed from vessel 10 after allowing reaction vessel 10 to cool. The shape of compact 12 before the reaction remains almost unchanged in the shape of the compact after the reaction, it is composed almost by the generated niobium, the compound of the active metal generated by reduction (by-products), the reducing agent of excess, and the ~~reaction-agent~~ active metal compound. Next, the

formed niobium can be separated from the active metal compounds, reducing agent, ~~reaction agent~~ active metal compound and reaction products that formed due to reduction by performing acid treatment on the compacts removed from the reaction vessel, thereby allowing the obtaining of niobium powder. This acid treatment is carried out by, for example, acid substitution treatment using water or organic solvent after performing acid leaching. Various acids such as hydrochloric acid, acetic acid, nitric acid, hydrofluoric acid or sulfuric acid can be used for the aforementioned acid leaching.

Please replace the paragraph beginning at page 18, line 14, with the following rewritten paragraph:

An active metal compound of at least one of metal selected from calcium, magnesium, sodium, barium and potassium is preferably used for the aforementioned reaction agent, and an oxide, halide, carbonate, hydroxide, chloride and/or fluoride of these metals is used more preferably. More specifically, calcium chloride, calcium carbonate, sodium carbonate or sodium chloride and so forth such oxides, halides and carbonates can be used alone or as a mixture. The mixing ratio of the aforementioned ~~reaction agent~~ active metal compounds is preferably such that cations in the ~~reaction agent~~ active metal compound are preferably blended at 0 to 2 moles and more preferably at 0.5 to 1 mole with respect to 1 mole of tantalum contained in the compact. The reaction efficiency and uniformity of the reducing step can be further enhanced by using a compact containing this type of active metal compound as a ~~reaction agent~~ active metal compound.